SUMMARY AND ACRONYMS AND ABBREVIATIONS

SUMMARY

Introduction

Alcoa Inc. (Alcoa) proposes to construct and operate the Three Oaks Mine, a surface lignite mine that would be located east of Austin in Lee and Bastrop Counties, Texas. Upon receiving all of the required permits and authorizations, construction is projected to begin in 2003, with operation commencing by 2004 and continuing for a period of approximately 25 years. The proposed project would include the mining of an average of 7.0 million tons of lignite per year in sequential mine pits. The lignite would be trucked to a central blending facility and subsequently transported via haul road or overland conveyor to four existing electrical power generating units located near Rockdale, in Milam County. The project also would include construction of surface water control facilities, power lines, maintenance facilities, offices, and the installation of groundwater wells. Up to approximately 12,000 acre-feet of groundwater would be pumped annually for mine dewatering and depressurization. Several existing county roads and utility lines would be relocated. Development of the Three Oaks Mine is proposed as a fuel-source replacement for the Sandow Mine, which Alcoa currently operates near Rockdale. The Sandow Mine has operated since the 1950s and will cease operations by 2005.

The project would require a permit from the Railroad Commission of Texas (RRC) under Title 16, Part 1, Chapter 12 of the Texas Administrative Code. The RRC permit area for the proposed Three Oaks Mine consists of 16,062 acres; within the permit area, a total of 8,648 acres would be disturbed over the 25-year life of the mine for mining and ancillary facilities. Of this total, approximately 640 acres would be disturbed for surface mining at any one time, based on sequential backfilling and concurrent reclamation of the mine pits. A total of 6 acres would be disturbed for relocated roads outside of the RRC permit area. City Public Service, the City of San Antonio public utility, owns 9,911 acres of land within the RRC permit area and controls an additional 1,721 acres through leases. Alcoa owns 2,855 acres and leases 548 acres within the permit area.

The proposed project requires a permit from the U.S. Army Corps of Engineers (USACE) for the discharge of dredged and fill material into waters of the United States (U.S.) under Section 404 of the Clean Water Act. Because the permit decision is a major federal action with the potential to significantly affect the quality of the human environment, the USACE has determined that an environmental impact statement (EIS) is necessary. The USACE is the federal agency preparing the EIS in compliance with the National Environmental Policy Act of 1969. The USACE's permit area for this EIS comprises the RRC permit area for the Three Oaks Mine and the additional 6 acres of disturbance associated with proposed relocated roads outside of the RRC permit area. Alternatives available to the USACE include issuance of a Section 404 permit, issuance of a permit with conditions, or denial of the permit application.

This EIS describes the proposed construction, operation, and reclamation of the Three Oaks Mine (the Proposed Action), including Alcoa's proposed environmental protection measures; identifies alternatives to the Proposed Action available to Alcoa; identifies alternatives available to the USACE relative to the Section 404 permit; and describes the environmental consequences of implementing the Proposed Action and the No Action Alternative.

The proposed Three Oaks Mine would involve a number of activities, which are discussed in much greater detail in Chapter 2.0, and would result in various environmental impacts, which are identified and discussed in Chapter 3.0. The basic construction, operation, and reclamation activities include the following:

- Clearing or vegetation removal from several hundred acres each year;
- Construction of support facilities, haul roads, public road reroutes, and utility reroutes upon project commencement;
- Excavation of a mine pit to access the lignite seams, accompanied by selective stockpiling of the overburden;
- Pumpage of groundwater from below and immediately above the lignite seams;
- Removal of the exposed lignite from the pit, and transport of the lignite to the existing Rockdale power generating station;
- Selective replacement of overburden and soil materials in the previously mined pits;
- Reshaping and recontouring of the previously mined area to the desired post-mine topography;
- Revegetation of the previously mined area; and
- Final closure and reclamation of ancillary facilities.

These activities, with the exception of the initial construction and final closure and reclamation, would continue repeatedly throughout the life of the mine until the lignite has been removed from the entire mine area. This is the same process that has been occurring at the nearby Sandow Mine for the past 50 years. The primary difference between the proposed Three Oaks Mine and the existing Sandow Mine, aside from the location, is that substantially less groundwater would be pumped for the proposed Three Oaks Mine.

Summary of Impacts

The following sections summarize the environmental impacts associated with the proposed Three Oaks Mine, as identified in this EIS. A table summarizing and comparing the impacts of the Proposed Action and the No Action Alternative is provided in **Table 2-16** in Chapter 2.0. Descriptions of the potential direct, indirect, and cumulative impacts of the Proposed Action and the No Action Alternative and monitoring and mitigation measures that may be appropriate are provided in Chapter 3.0 of this EIS.

Geology and Mineral Resources

Lignite mining at the Three Oaks Mine permanently would alter the topography in the disturbance area, particularly at the end lakes where topographic depressions may be created. Other areas would be recontoured to slopes that are similar to pre-mining conditions. No geologic hazards are expected to affect

the mine during operation, and none would remain in the permit area following reclamation. Mining permanently would remove the economic lignite resources within the mined area and may affect existing clay resources. Existing geologic strata of sands, clays, and silts would be replaced by a mixed substrate to the depth of the lowest lignite seam to be mined, ranging from 30 feet to 250 feet.

Based on the current lignite production trends in Texas and foreseeable mining activity in the near future, the cumulative impacts of lignite mining at the Three Oaks Mine, relative to geology and mineral resources, appear to be minimal.

Water Resources

Groundwater

The proposed Three Oaks Mine would pump groundwater from the Simsboro aquifer for mine depressurization and groundwater from the Calvert Bluff aquifer for mine dewatering in order to facilitate mining. Depressurization pumpage would reach approximately 11,000 acre-feet per year by the end of the estimated 25-year life of the Three Oaks Mine. Pumpage for dewatering is expected to range from approximately 300 to 1,300 acre-feet per year over the life of the mine.

Groundwater levels in the Simsboro aquifer would decline approximately 10 to 50 feet in the outcrop area west of the proposed Three Oaks Mine; the potentiometric surface in the artesian portion of the Simsboro aquifer beneath the mine permit area would decline approximately 100 to 200 feet. The artesian portion of the Simsboro aquifer lies at depths of several hundred feet below the mine permit area. With a decline of 200 feet in the potentiometric surface, the aquifer would remain saturated.

The Calvert Bluff aquifer also lies at substantial depths below the mine permit area and largely is under artesian pressure. In the lowest lignite zone of the Calvert Bluff, the potentiometric surface would decline approximately 10 to 100 feet outside of the permit area and 100 to 200 feet within the permit area of the proposed Three Oaks Mine. For the Calvert Bluff upper lignite zone, the potentiometric surface would decline approximately 10 to 20 feet outside of the permit area and up to 50 feet within the permit area.

Private and municipal wells that are located within the area where groundwater drawdown is estimated to be 10 feet or less would be unlikely to be affected. Wells located within the drawdown areas of 20 feet or greater for either the Simsboro aquifer or the lower-third of the Calvert Bluff aquifer may need to be modified or replaced. Alcoa would mitigate any mine-related impacts to these wells, as required by the RRC.

Cumulative impacts due to groundwater withdrawal primarily would be the result of regional municipal pumpage of groundwater in the lower basin area of the Brazos G Regional Water Planning Area. Pumpage of groundwater from the Sandow Mine and proposed Three Oaks Mine areas by the San Antonio Water System (SAWS) also would contribute substantially to cumulative groundwater impacts. The proposed Three Oaks Mine would have a limited contribution to cumulative groundwater impacts, as mine-related drawdown mainly would be in the immediate Three Oaks Mine area and would cease in approximately year 2030, shortly after the proposed Three Oaks Mine ceases operation. In addition, if municipal and SAWS pumpage reduces the artesian head pressure in the mine area, then Alcoa's depressurization goals would

be met through a reduction in mine-related pumpage from the Simsboro aquifer. Three cumulative impact scenarios were evaluated in this EIS.

- Under the Three Oaks without SAWS cumulative scenario, drawdown in the Calvert Bluff aquifer would be approximately 10 to 20 feet in the mine area and 10 feet outside of the mine area by year 2030. By year 2050, the drawdown in the mine area and in adjacent areas of Lee, Bastrop, and Milam Counties would be approximately 10 feet. Drawdown in the Simsboro aquifer would be 70 to 80 feet in the mine area, 20 to 50 feet in the outcrop area of the Simsboro west of the mine, and 20 to 50 feet near the Colorado River in Bastrop County by year 2030. By year 2050, drawdown in the mine area would be approximately 60 feet and drawdown in the outcrop area and near the Colorado River would be 20 to 50 feet.

- Under the Three Oaks with SAWS cumulative scenario, drawdown in the Calvert Bluff would be approximately 20 feet in the mine area and approximately 10 to 20 feet in adjacent areas of Lee, Bastrop, and Milam Counties by year 2030. By year 2050, drawdown throughout most of the Calvert Bluff in the Three Oaks and Sandow Mine areas would be approximately 10 feet. For the Simsboro aquifer, drawdown at the mine area would be approximately 60 to 100 feet by year 2030 with drawdown in the outcrop area west of the mine being approximately 30 to 50 feet, drawdown in the outcrop area west of the Sandow Mine being approximately 40 to 100 feet, and drawdown at the Colorado River in Bastrop County being approximately 10 to 50 feet. By year 2050, drawdown in the Three Oaks Mine area would be approximately 100 to 180 feet, drawdown in the outcrop area west of the mine would be approximately 70 to 100 feet, and drawdown at the Colorado River would be 10 to 80 feet.

- Under the SAWS without Three Oaks cumulative scenario, drawdown in the Calvert Bluff would be approximately 10 feet throughout Lee, Bastrop, and Milam Counties by year 2030. This would remain approximately the same through year 2050. For the Simsboro aquifer, drawdown in the mine area would be approximately 70 to 130 feet by year 2030 with drawdown in the outcrop area of the Simsboro west of the mine being approximately 40 to 70 feet, and drawdown at the Colorado River in Bastrop County being approximately 10 to 50 feet. By year 2050, drawdown at the mine area would be approximately 100 to 210 feet, drawdown in the outcrop of the Simsoboro west of the mine would be approximately 70 to 100 feet, and drawdown at the Colorado River would be approximately 10 to 80 feet.

Surface Water

Approximately 38 miles of intermittent and ephemeral stream channels would be removed during the life of the proposed Three Oaks Mine. In addition, approximately 150 stock ponds would be removed in phases as mining progresses, and other small stream channels would be restricted from continuing downstream by the post-mining topography. The phased removal of surface water features would be offset at least in part by creating and enhancing additional wetlands and riparian woodland at the Middle Yegua Creek Mitigation Site, by restoring waters of the U.S. and other water features at the replacement ratios proposed in Alcoa's draft Mitigation Plan, by implementing the riparian corridor restoration aspects of the fish and wildlife plan, and by the placement of small ponds and establishment of end lakes as proposed in the reclamation plan.

Construction and operation of the proposed surface water management system would reduce sediment yields, attenuate peak flows, lengthen the duration of flows by routing them through the system, and manage runoff water quality in accordance with Texas Natural Resource Conservation Commission and RRC regulations. Monitoring and compliance with Texas Pollutant Discharge Elimination System (TPDES) and Clean Water Act Section 401 water quality certification requirements would mitigate potential impacts to surface water quality. During mining, increased surface water flows would occur in Big Sandy Creek and Middle Yegua Creek as a result of flow augmentation from groundwater pumping discharges. During pumping and discharge, the volume and duration of these augmented flows generally would offset the potential flow reduction associated with groundwater drawdown in these drainages. When the discharges cease, water level changes associated with groundwater drawdown would decrease seasonal flows on gaining stream reaches (within the 20-foot drawdown area of the Simsboro outcrop) and channels immediately downstream of the discharge areas. These effects would be most noticeable during low-flow periods. These potential effects generally would mimic pre-mining conditions, where streams lose flows through seepage to aquifer recharge, or typically go dry under natural conditions.

Erosion and sedimentation would be limited during mining by phased, concurrent reclamation and by the proposed surface water management system. After mining, recontouring and revegetation in accordance with RRC requirements would mitigate potential erosion and sedimentation impacts. The post-mining topography would route approximately 15.3 square miles of watershed area through end lakes, which may not contribute to streamflows during average and low-flow runoff events. During periods when the lakes are nearly full and evaporation rates are low, larger runoff events would contribute to downstream flows after being routed through the proposed sediment ponds and end lakes, ultimately discharging to streams. Following mining and reclamation, reduced baseflows would occur from groundwater drawdown. On streams near the mine area, this would cause net reductions in seasonal flows, which gradually would be alleviated as aquifer recharge occurs over time. Post-mining effects would decrease farther downstream as additional tributaries contribute flows, and as naturally occurring seepage and evapotranspiration occur. No impacts to the Colorado River or Somerville Lake are anticipated from the Proposed Action. Also, no impacts to surface water rights are anticipated from the Proposed Action. Additional monitoring and mitigation measures may be appropriate as determined by the USACE with respect to low-flow effects, end lake shoreline configurations, control of erosion and sedimentation at the end lake outlets and stream crossings along the proposed haul road, and management of pumping discharges through TPDES outfalls.

Cumulative impacts to surface water resources would result from the existing operation and final reclamation of the Sandow Mine; construction, operation, and reclamation of the proposed Three Oaks Mine; and surface water effects associated with water level changes in the drawdown area of the Simsboro outcrop as a result of regional pumping in the Simsboro aquifer. These impacts would include the creation of end lakes and a greater number of large ponds in place of distributed smaller ponds, a minor reduction of average annual surface water yields, control of flows in ephemeral drainages immediately downstream of the end lakes, and reduced groundwater contributions to stream flows in gaining reaches (segments of streams that receive a portion of their flow from groundwater sources) of area streams within the 20-foot drawdown area of the Simsboro outcrop. The extent and magnitude of the latter impact largely would depend on the demand for groundwater supplies in the region. These impacts would occur to varying degrees depending on the cumulative impact scenario. Additional evaporation of surface water from the end lake surfaces would occur; however, this is not likely to create an incremental impact beyond the existing

causes of surface water losses in the region. Overall, it is anticipated that the Three Oaks Mine only would contribute minimally to cumulative impacts on surface water quantity. It is anticipated that the Three Oaks Mine would not contribute cumulatively to impacts on water quality or surface water rights in the Colorado River.

Waters of the U.S. Including Wetlands

A total of 67.4 acres of jurisdictional waters of the U.S. would be impacted as a result of mine construction and operation. This would include 5.3 acres of wetlands, 19.9 acres of ephemeral stream channels, 3.7 acres of intermittent stream channels, and 38.5 acres of on-channel ponds. In addition, approximately 5.2 acres of wetlands, approximately 11.5 acres of streams with associated riparian habitat, and approximately 56.8 acres of on-channel ponds that are located outside of the disturbance area may be affected as a result of water level changes in the drawdown area of the Simsboro outcrop. Concurrent reclamation would result in the onsite replacement of a total of 86.7 acres of waters of the U.S., including 5.3 acres of wetlands, 23.6 acres of stream channel, and 57.8 acres of on-channel ponds. An additional 5.3 acres of wetlands would be created, and 20.6 acres of riparian vegetation would be enhanced, at the offsite Middle Yegua Mitigation Site.

The short-term loss of waters of the U.S. (wetlands), which would be disturbed and replaced incrementally over 25 to 30 years, would result in the temporary loss of their functional value (e.g., runoff and sediment retention), potentially affecting downstream water quality. Additionally, the removal of jurisdictional watercourses would alter the flow pathways for runoff water. However, implementation of the proposed storm water management system, including the construction of sediment ponds and diversion channels, likely would provide comparable or greater storm water management and sediment removal capacities than the affected water features. Implementation of Alcoa's proposed Mitigation Plan would result in the creation and enhancement of wetlands and riparian woodlands at the offsite Middle Yegua Creek Mitigation Site during the initial years of the project, thereby providing early, partial mitigation for the anticipated impacts related to the mine.

Minor temporary increases in sediment loading to ephemeral and intermittent streams likely would result during initial construction activities while sediment and surface water management systems are being installed. Subsequently, sediment yields to area streams likely would be less than under pre-mining conditions, potentially resulting in a change in substrate in receiving streams. However, this change is expected to be minor and would be substantially attenuated at the nearest downstream impoundment or tributary on each channel.

Although it is difficult to quantify the number and extent of impacts to waters of the U.S. including wetlands on a regional level, it is assumed that a net gain of waters of the U.S., including wetlands, would occur as a result of past, present, and reasonably foreseeable future actions. This gain is attributed, in part, to the creation of Lake Bastrop and Alcoa Lake, which substantially increased the acreage of jurisdictional waters of the U.S., including wetlands, within the cumulative effects area. This net increase would provide a beneficial effect to water quality through stormwater retention and increased runoff filtration.

Based on the anticipated minor and localized effect on sediment yields and associated substrates in receiving streams under the Proposed Action, the proposed project would not contribute to sediment-related cumulative effects for waters of the U.S.

Soils

A total of 8,654 acres of soils would be disturbed as a result of the Proposed Action. Potential adverse impacts resulting from soil erosion and slope instability would be controlled or prevented through implementation of erosion control, slope design, and reclamation measures. Reclamation would include the use of selected growth media, soil amendments, and revegetation practices that have been demonstrated to be effective under similar conditions at the existing Sandow Mine. Accelerated erosion and sedimentation are not anticipated due to the nature of the reclaimed growth media and Alcoa's commitment to implement measures to control erosion and sedimentation through concurrent reclamation, Best Management Practices, and long-term revegetation. Approximately 722 acres of end lakes would be constructed during reclamation. No prime farmlands would be affected as result of end lake development; however, long-term impacts to native soils would result. Approximately 56 acres of prime farmland temporarily would be affected as a result of other activities associated with mine construction and operation.

Surface disturbances resulting in the removal or disturbance to native soils within the cumulative effects area would be associated with Sandow and Powell Bend Mines; clay mining operations in the Butler and Elgin area; the Rockdale, Lost Pines 1, and Sim Gideon power generating stations; and the proposed Three Oaks Mine. A combined total of approximately 27,218 acres of native soils would be removed or disturbed within the cumulative effects area. Of this total, a maximum of approximately 23,132 acres have been or would be revegetated. The remaining acreage has been or would be reclaimed as ponds and end lakes, resulting in a cumulative loss of approximately 3,274 acres of native soils through conversion of these lands to water features.

Vegetation

A total of 8,654 acres of vegetation in five plant communities, excluding small areas occupied by residences, roadways, and other existing disturbances, would be disturbed incrementally in the short-term following implementation of the Proposed Action. A total of approximately 825 acres, primarily associated with end lakes, would be converted from upland vegetation to surface water resources in the long term; the remainder of the disturbance area would be revegetated. Successful reclamation and implementation of the recommended invasive plant species controls would reduce the potential for impacts associated with invasive species.

No impacts have been identified for any federally or state list species or their habitats or any species of special concern as a result of mine-related development, water level changes, or discharges.

Under the Three Oaks without SAWS cumulative scenario, surface disturbances resulting in the removal of vegetation within the cumulative effects area include the Sandow and Powell Bend Mines; clay mining operations in the Butler and Elgin area; the Rockdale, Lost Pines 1, and Sim Gideon power generating stations; and the proposed Three Oaks Mine. A combined total of approximately 27,218 acres of vegetation

would be removed within the cumulative effects area. Of this total, a maximum of 23,132 acres have been or would be revegetated, with the remaining area reclaimed as ponds and end lakes. Based on a combined 188 acres of previously existing water features, there would be a cumulative loss of approximately 3,274 acres of vegetation as a result of conversion of these lands to water features.

Water discharge from the Three Oaks Mine would augment flows in Big Sandy, Middle Yegua, and Chocolate Creeks approximately 4 to 6 miles downstream of the discharge points resulting in the establishment of riparian vegetation due to increased water availability. This augmentation temporarily would offset the progressive loss of riparian vegetation resulting from the cessation of discharges from the Sandow Mine in East Yegua and Walleye Creeks. Following the cessation of Three Oaks Mine discharges in approximately 2030, and with continued drawdown in the Simsboro aquifer from municipal pumpage, there would be a progressive loss in riparian vegetation associated with the drainages within the 20-foot drawdown area of the Simsboro outcrop.

Under the Three Oaks with SAWS cumulative scenario, surface disturbance to vegetation within the cumulative effects area for the Three Oaks Mine and impacts associated with water level declines would be the same as discussed for the Three Oaks Mine without SAWS cumulative scenario. The effects from water discharge also would be similar; however, with the implementation of SAWS, flow augmentation from the mine and the resulting effects would occur earlier (starting in year 2013).

Under the SAWS without Three Oaks cumulative scenario, surface disturbance to vegetation within the cumulative effects area and the impacts associated with water level declines would be the same as discussed for the Three Oaks without SAWS cumulative scenario, minus the impacts from the proposed Three Oaks Mine. Riparian vegetation along Big Sandy and Middle Yegua Creeks would not benefit from water discharged from the Three Oaks Mine.

Fish and Wildlife Resources

Implementation of the proposed project would include the phased (over the 25-year life of the mine) direct disturbance of 8,654 acres of land, most of which currently offers some value as wildlife habitat. Wildlife habitat incrementally would be recreated throughout most of this area as concurrent reclamation proceeds behind the mining operations. Impacts to wildlife would include direct mortalities from construction activities, incremental habitat fragmentation, animal displacement, increased noise, additional human presence, and the potential for increased vehicle-related mortalities. Incremental short-term habitat loss through the life of the mine could affect big game, upland game birds, waterfowl, raptors, songbirds, and amphibians and reptiles. The limited amount of habitat affected, relative to that available in the surrounding area, is not expected to result in substantive population reductions of any local wildlife species. These populations would be expected to recover following mine reclamation.

Mine-related water level changes in the 20-foot drawdown area of the Simsboro outcrop would reduce the amount and extent of surface water and associated riparian and wetland habitats of springs, seeps, and intermittent stream reaches with perennial pools within the effected area that are used by a variety of wildlife. Potential reduction or loss of available water could affect wildlife resources as a result of: 1) a decrease in available water for consumption; 2) loss of breeding, foraging, and cover habitats; 3) reduction

in regional carrying capacity; and 4) displacement and loss of animals. The extent of these effects would depend on the species' use of the affected area and their relative sensitivity, the extent of habitat reduction, and the availability of similar habitats in the area. These effects temporarily would be offset during the life of the mine as a result of mine-related water discharge which would increase water availability and riparian habitat downstream of the discharge points during the life of the mine.

The new power line segments and associated substation would increase the collision potential for migrating and foraging bird species that occur within the permit area by a small increment due to the increased route length. In addition, the relocated 14.4-kilovolt (kV) power line and new 25-kV power lines would pose an electrocution hazard for raptor species attempting to perch on the structures. The USACE is evaluating potential mitigation to address these impacts.

Potential impact to the federally endangered Houston toad could include incremental habitat loss if mine-related discharge to Middle Yegua Creek reaches the floodplain that bisects the Carrizo outcrop. However, based on the lack of appreciable amounts of suitable Houston toad habitat within the alluvial floodplain and the potential for flow alteration at the Carrizo outcrop, potential impacts to the Houston toad, if present, would be anticipated to be low. No impacts to any other federally listed or proposed or federal candidate species would occur as a result of the proposed project. Project development has the potential to directly affect two Texas state listed species (timber/canebrake rattlesnake and Texas horned lizard); however, based on Alcoa's committed environmental protection measures for these species, these impacts are anticipated to minimal.

Surface disturbance would affect aquatic communities by incrementally removing approximately 38 miles of intermittent/ephemeral streams, approximately 38.5 acres of on-channel ponds, and approximately 31.4 acres of isolated stock ponds during the life of the mine. Aquatic communities affected by this habitat loss would include macroinvertebrates, periphyton, and fish species that occur seasonally in intermittent/ephemeral reaches and year-round in perennial pools. The duration of impacts would be approximately 20 to 22 months in each phased-disturbance area. The loss of some intermittent/ephemeral reaches would occur throughout the life of the mine.

Water level changes within the 20-foot drawdown area of the Simsboro outcrop would result in aquatic habitat reductions in Big Sandy and Middle Yegua Creeks for macroinvertebrates, periphyton, and fish. However, this impact temporarily would be offset by water discharges from the Three Oaks Mine, resulting in increased habitat for aquatic communities below the discharge points during the life of the mine. Riffle and run habitat would be added to the existing perennial pool habitat. Additional aquatic species may colonize the areas with more persistent flow.

Cumulative impacts on wildlife species under the Three Oaks without SAWS cumulative scenario would result from surface disturbance, water level changes, and water discharges. Proposed surface disturbance within the cumulative effects area would include the incremental loss of approximately 23,218 acres, of which approximately 23,132 acres would be reclaimed as fish and wildlife habitat, pastureland, cropland, and undeveloped lands. Based on a combined 188 acres of previously existing water features, there would be a net cumulative increase of 3,274 acres of aquatic habitat. These reclaimed lands would contribute to post-mining wildlife habitat. Overall, cumulative impacts would parallel those discussed above for the

proposed project. Consequently, cumulative impacts to wildlife resources including sensitive wildlife resources (i.e., special status species and species of special concern) that potentially could occur within the cumulative effects area would include habitat loss or alteration, fragmentation, animal displacement, and direct mortalities from construction activities.

The projected water level change from mining activities and municipal pumping would result in a cumulative reduction in the amount and extent of available surface water and associated riparian, wetland, and mesic habitats for area wildlife. Potential loss or reduction of available water and riparian and wetland communities could result in the loss of cover, breeding, and foraging habitats; reduction in available water for consumption; increased animal displacement and loss; reduction of overall biological diversity; reduction in the area's carrying capacity; and possible population declines. Continued pumping by municipalities and other users beyond closure of the Three Oaks Mine would adversely affect surface water and riparian and wetland habitats that receive baseflow from the Simsboro outcrop in the cumulative effects area. However, these cumulative effects would be offset by the development of approximately 1,667 acres of streams, ponds, and end lakes in the reclaimed areas of the Three Oaks and Sandow Mines, as well as the reclamation of riparian habitats within the mine areas. The cessation of Sandow Mine discharges would end artificial flow augmentation and return East Yegua and Walleye Creeks to their original intermittent/ephemeral regime. Potential effects from the cessation of these artificial flow augmentations would result in the reduction of existing surface water features as well as the incremental long-term reduction of riparian habitat for wildlife. These potential effects would be somewhat offset by surface water discharges from the Three Oaks Mine to the Big Sandy Creek and Middle Yegua Creek drainages until approximately year 2030, when the discharges would end.

Potential cumulative effects to wildlife and their habitats from surface disturbance under the Three Oaks Mine with SAWS cumulative scenario would be the same as described above for the Three Oaks without SAWS cumulative scenario. Potential cumulative impacts from water level change also would be the same as discussed above for the Three Oaks Mine without SAWS scenario; however, the implementation of SAWS would result in different patterns of temporal reduction relative to surface water. Prior to 2013, the potential impacts of water level change on surface water as well as riparian and wetland habitats along Big Sandy and Middle Yegua Creeks temporarily would be offset by discharge contributions from the Three Oaks Mine. However, after year 2013, flow augmentation to the creeks would cease, and cumulative water level changes resulting from groundwater pumpage for SAWS, local municipal use, and other local uses would continue to reduce the amount of surface water as well as riparian and wetland habitats for area wildlife.

Under the SAWS without Three Oaks cumulative scenario, the Three Oaks Mine would not contribute cumulatively to habitat impacts associated with surface disturbance or water level changes. The impacts of municipal and SAWS-related pumpage on water levels, and the associated effects to habitat, would be similar to those described above for the Three Oaks without SAWS cumulative scenario. However, since there would be no water discharges from the Three Oaks Mine, there would be no temporary offset in the effects of water level changes on local water resources.

Cumulative impacts on aquatic species under the Three Oaks without SAWS cumulative scenario would result from surface disturbance, water level changes, and water discharges. Quantifiable impacts to aquatic

habitats as a result of surface disturbances associated with interrelated actions have been evaluated. Disturbance to-date at the Sandow Mine has resulted in the removal of approximately 83.3 acres of pond and intermittent/ephemeral stream habitat. Ongoing disturbance at Sandow and future disturbance at Three Oaks incrementally would remove additional aquatic habitat consisting of intermittent/ephemeral streams (approximately 33 acres) and ponds (approximately 95 acres). Loss of these types of habitat would result in the elimination of macroinvertebrates, periphyton, and possibly nongame fish species during mining. Reclamation at these sites, as well as the development of aquatic habitats in association with other interrelated actions, would result in a net increase in pond/lake habitat (approximately 3,274 acres) and the replacement of some of the intermittent/ephemeral reaches, which would be recolonized by aquatic species. After reclamation is completed at these mines, slight reductions in runoff could occur downstream of the end lakes, which could result in relatively small flow reductions in the Big Sandy, East Yegua, and Middle Yegua drainages. As a result, slight reductions in aquatic species' abundance could occur in these drainages. Cumulative water level changes also would result in reduced aquatic habitat due to flow reductions in the Big Sandy drainage, with reduced populations of aquatic species. The cessation of water discharges from the Sandow Mine would end artificial flow augmentation and return East Yegua and Walleye Creeks to their original intermittent/ephemeral regime. Flows in Middle Yegua Creek would not be affected by the end of the Sandow Mine discharges until after approximately year 2030, when water discharges from the Three Oaks Mine would end. Until 2030, water discharges from Three Oaks would augment flows and increase aquatic habitat in Middle Yegua and Big Sandy Creeks, as discussed under the Proposed Action.

Potential cumulative impacts to aquatic species for the Three Oaks with SAWS cumulative scenario generally would be similar to the types of impacts in the upper portions of the drainages as discussed above for the Three Oaks Mine without SAWS cumulative scenario. The effects of water level changes on aquatic habitat also would be similar, except there would be a wider regional impact area that would extend northward along the Simsboro outcrop. However, flow augmentation would not occur under this scenario after 2013, which would result in an earlier reduction in aquatic habitat below the discharge points in the Big Sandy and Middle Yegua drainages.

Impacts on aquatic species under the SAWS without Three Oaks cumulative scenario primarily would relate to flow changes. Under this scenario, the Three Oaks Mine would not contribute cumulatively to the removal of existing surface water features, watershed modifications, or water level changes. Aquatic habitat would be reduced in Big Sandy and Middle Yegua Creeks due to non-mine-related water level changes in the 20-foot drawdown area of the Simsboro outcrop, which would reduce aquatic species' abundance. Since there would be no water discharges from the Three Oaks Mine, there would be no temporary offset in the effects of water level changes on local water resources.

Paleontological Resources

Based on the type and prevalence of the paleontological resources associated with the Calvert Bluff Formation, the potential for adverse impacts as a result of mine development would be minimal.

Based on the existing and ongoing disturbances at the existing Sandow Mine and local clay pits, the Three Oaks Mine would result in a minor incremental increase in impacts (i.e., loss of context, scientific information, and educational value) to paleontological resources associated with the Calvert Bluff Formation.

However, based on the prevalence of these paleontological resources in the region, these effects are considered minor.

Cultural Resources

Implementation of the Proposed Action would result in direct disturbance to 134 cultural sites, including 4 of the 5 sites which have been determined by the Texas Historical Commission (THC) to be eligible to the National Register of Historic Places (NRHP). Visual impacts would occur at the fifth NRHP-eligible site. The remainder of the sites are either undergoing further evaluation or testing, prior to subsequent review and evaluation by the THC, or have been determined by the THC to be ineligible for inclusion in the NRHP. Final determination by the THC on all sites currently undergoing testing or additional review would need to be completed prior to ground-disturbing activities in the vicinity of these sites. Site protection or treatment plans also would need to be implemented and completed at all sites determined by the THC to be eligible to the NRHP, if the sites cannot be avoided. In addition, no disturbance to cultural sites would occur without prior written approval by the THC and RRC.

Approximately 150 acres within the mine area have not been surveyed to-date. Surveys and cultural resource review would need to be completed for this area prior to ground-disturbing activities in the vicinity.

Although difficult to quantify, cumulative impacts to cultural resource sites would include natural impacts (i.e., erosion and dilapidation), as well as direct disturbance and removal of cultural sites that were located, or are currently located, within the interrelated actions' areas of disturbance. However, all NRHP-eligible sites at the Three Oaks Mine would be mitigated in accordance with site protection or treatment plans in coordination with the THC, USACE, and RRC, thereby minimizing direct cumulative impacts to cultural resources. Based on the distance between the interrelated actions, no cumulative visual impacts to cultural resources are anticipated.

Air Quality

Construction and operational activities at the proposed Three Oaks Mine would be sources of total suspended particulate and particulate matter of less than 10 and 2.5 microns in diameter and would affect air quality in the vicinity of the mine. Fuel-burning mobile (on road and off road) sources would emit low levels of gaseous pollutants (e.g., sulfur dioxide [SO_2], nitrogen oxides [NO_x], carbon monoxide, and volatile organic compounds [VOCs]). Storage tanks for fuels, oil, and chemicals are potential sources of VOCs. Based on the results of dispersion modeling, the spatial extent of impacts is expected to be less than 7 kilometers (4 miles) from the mine boundary. The USACE is considering mitigation measures (i.e., selective berm placement or relocation of the mine area boundary or roads) to ensure that Ambient Air Quality Standards are met. Levels of gaseous air contaminants and particulates are anticipated to remain well below levels determined to be detrimental to public health. There would be no air quality impacts on Class I areas due to the operation of the Three Oaks Mine, since there are no PSD Class I areas (areas where very little deterioration of air quality is allowed) within 100 kilometers (approximately 60 miles) of the mine.

Cumulative impacts to air quality would include impacts from the proposed Three Oaks Mine, impacts from nearby existing and proposed industrial or mining operations, and impacts from background emission sources including natural sources such as windblown dust and manmade sources such as public traffic on paved and unpaved roads. Emissions of all criteria pollutants except NO_x and SO_2 in the five-county area are predominantly from mobile road sources, non-road mobile sources, and area sources.

The two largest sources of particulate emissions are fugitive dust and agriculture, which account for over 92 percent of all particulate emissions. Fugitive dust emissions from the Sandow Mine will diminish as the operations there are phased out. When impacts from other sources in the area are added to the new emissions at the Three Oaks Mine, the resultant cumulative particulate matter impacts are expected to be less than the existing impacts near the Sandow Mine, which are well below state and federal standards.

The largest point sources of gaseous pollutants in the region are the power plants and smelter at the Rockdale operations in Milam County. These Alcoa facilities are being upgraded to reduce particulate matter, NO_x, and SO_2 emissions. The proposed Three Oaks Mine would have minor incremental impacts from gaseous pollutants since the mine would contribute only a small fraction of such pollutants compared to these and other mobile and non-mobile sources in the area.

Land Use and Recreation

Approximately 8,654 acres of the permit area would be disturbed over the 25-year life of the proposed project. Nearly 75 percent of the total (6,466 acres) would be disturbed for the mine itself; approximately 640 acres would be disturbed at any one time due to sequential backfilling of the pits and concurrent reclamation. Existing uses of the disturbance area, including agriculture, temporarily would be interrupted for the life of the mine, although all except the area actually disturbed at any particular time would remain rural in character. Post-mine land uses would be similar to existing land uses. There are no state or local land use plans or regulations that would apply to the Three Oaks project area.

The proposed Three Oaks Mine would have minimal effects on recreation resources. There are no existing public recreation facilities in the permit area. The small amount of private recreation that now occurs would be precluded from the disturbance area for the life of the mine; it would be displaced to other public or private lands in the area; however, this would have minimal effects on recreation resources in the region.

Cumulatively, land disturbance at the Three Oaks Mine would be offset in the short-term by reclamation of the Sandow Mine for rural uses, primarily improved pasture. Long-term, reclamation at Three Oaks would reinforce the existing rural character of the area and would tend to offset urbanizing pressures in the area. Mine-related as well as municipal and SAWS pumpage could adversely affect area wells; however, SAWS has committed to comply with RRC well mitigation requirements that apply to lignite mining, including the Three Oaks Mine, so adverse effects would be mitigated. There would be slight cumulative reductions in local agricultural production due to the combined effects of the Three Oaks Mine, the proposed regional habitat conservation plan, and the proposed utilities habitat conservation plan. Cumulative effects on recreation would be unlikely.

Social and Economic Values

The Proposed Action would employ approximately 150 contract workers during construction. Approximately 210 permanent employees and 50 contract workers would be employed during operation of the project. The operating work force would be transferred from the existing Sandow Mine and would not measurably affect the population of the study area. Project-generated personal income also would track trends established at Sandow, so the combined opening of the Three Oaks Mine and closure of the Sandow Mine would have no measurable effect of total study area income. The proposed project would increase mine-related tax revenues to Lee and Bastrop Counties, while the closure of the Sandow Mine would lead to diminished tax revenues in Milam County. These changes would be accompanied by only very minimal changes in demand for public services, as the population largely would remain in their existing locations. While this would affect local county governments (positively for Lee and Bastrop Counties and adversely for Milam County), it would have little or no effect on public schools, as the changes in local tax revenue to the independent school districts would be offset by changes in state financial support. Project-related effects on property values likely would be minor and temporary. Residential properties in close proximity to the mine disturbance area may experience a short-term decline in property values while the actual mining is taking place nearby; however, their values should rebound as the mining moves farther from them and reclamation is implemented.

Cumulative effects of the Three Oaks Mine and other reasonably foreseeable future projects would be minimal to non-existent. Employment increases, if any, from overlap with closure of the Sandow Mine would be very small and very short-term. Tax revenue increases to local jurisdictions from the Three Oaks Mine and non-mine-related population growth would offset increased service demands generated by that increased population.

Transportation

The Proposed Action would increase peak hour traffic on farm-to-market (FM) 696 from approximately 226 vehicle trips to 421 trips; however, the increase would be offset by substantial roadway improvements. While it is not possible to quantify the net effect of the project on highway safety, it is expected that the roadway improvements would offset any added risk from project-related traffic increases. County and state roadway reroutes would increase some travel distances and reduce others. The net effect on major routes would range from an increase of 1.1 miles to a decrease of 1.1 miles. Resulting delays in travel times for some routes would be offset to a degree by improvements to the roadways.

Cumulatively, traffic increases from the Three Oaks Mine and from non-project-related population growth may adversely affect FM 619 to a very small degree and would degrade the level of service on FM 696. Traffic levels would not exceed the capacity of the roadway, however. Widening of U.S. Highway 290 may attract a small amount of additional traffic on FM 696; however, any effects would be very minor. No other reasonably foreseeable future actions would be expected to adversely affect area transportation conditions.

Noise and Visual Resources

Construction noise from the proposed mine would not exceed the U.S. Department of Housing and Urban Development (HUD) 65 decibels on the A-weighted scale (dBA) (acceptable day-night average noise level [L_{dn}]) standard at sensitive receptors in the study area, although it would raise noise levels above ambient background levels during daytime hours at a few residences in the Willow Creek subdivision and near FM 619. There are a few instances where individual project-related noise sources would exceed the HUD 65 dBA (L_{dn}) standard at sensitive receptors in the study area during operation of the proposed Three Oaks Mine. This would occur primarily during year 1 for residences outside the mine disturbance area and in years 6 through 25 for the 2 private residences on inholdings within the disturbance area. The standard also would be exceeded if several sources were to operate simultaneously in close proximity to a residence. Exceedences likely would occur for periods of a few days to a few months at any one location. The draglines, some of the loudest sources, would operate throughout the night, and they exhibit pure tonal qualities in their noise emissions. Pure tones are known to cause community annoyance when they stand out above base noise levels. Also, even though the projected exceedences above the HUD standard would be relatively few, the projected noise levels would be well above existing ambient background levels. The U.S. Environmental Protection Agency has concluded that sound level increases greater than 10 dBA often cause nearby community members to take vigorous action to oppose the presence of the noise source and complaints could be expected. This concern applies mainly to major noise sources operating at night, including draglines removing overburden, other heavy equipment operations, and trucks operating on the haul road.

The Three Oaks Mine would change the visual character of the permit area for the life of the mine. The greatest effects would be to the mine disturbance area with lesser effects in the permit area beyond the disturbance area. The effects would include views of the draglines ranging from close-up to several miles distant. The transportation and utility corridor would be a strong linear feature in the landscape for the life of the mine. There also would be changes in the landscape character as existing vegetation would be stripped off, overburden would be dug out and stacked temporarily, and lignite would be removed before the pits are backfilled with overburden from the next pit. The modifications would be short-term for the most part. Areas mined in the first years of the project would be revegetated to grasses within approximately 2 years and would be returned to essentially a similar landscape character as the pre-mining environment by the end of the mine's life. The remainder of the disturbed area would be progressively reclaimed as well following completion of mining of each pit area. There also would be increased night lighting in the study area from the mine, and there would be long-term changes in linear features from realignment of several roads in the permit area.

Few, if any, cumulative noise effects would be anticipated from the Three Oaks Mine and other foreseeable future actions. Population growth in the study area would tend to raise background noise levels in the area; however, growth is expected to be modest and gradual during the life of the mine so cumulative noise effects would be minor. Long-term, reversion of the Three Oaks Mine disturbance area to rural character and land uses would tend to offset increased background noise levels from population growth. There may be very short-term cumulative noise level increases near U.S. Highway 290 during construction of road widening projects; however, the effects would depend on what, if any, mine activities are occurring nearby at

the same time. No other reasonably foreseeable future actions would be expected to adversely affect study area noise levels.

Cumulative visual effects from the Three Oaks Mine and other reasonably foreseeable future actions would be minor. Foreseeable future activities only would have very minor visual effects. There would be a gradual shift in visual character of the area from the current rural character to a slightly more urban character with future population growth. During the life of the mine, the combined visual effects would be slightly greater than the effects of the mine alone. Following completion of mining and reclamation, the return of the Three Oaks Mine disturbance area to rural character would tend to offset the more urban effects of future population growth. Other reasonably foreseeable future activities would not occur in the same viewshed as the Three Oaks Mine and would not cumulatively affect visual character in the study area.

Hazardous Materials

Lignite mining at the Three Oaks Mine would involve the transportation, storage, and use of various hazardous materials. With the exception of fuels and lubricants, these materials would be used in small quantities. Fuels would be transported in the greatest volume and, thus, would pose the greatest risk of a spill. The analysis indicates that there would be a 5 percent chance of an accident resulting in a spill during the 25-year life of the project. All hazardous materials would be transported and stored in accordance with federal and state regulations. All hazardous wastes also would be stored, packaged, and manifested in compliance with applicable federal and state regulations. These wastes would be transported by approved transporters to licensed hazardous waste disposal facilities. The implementation of spill and emergency response plans would minimize potential impacts in the event of an accidental release of fuel or hazardous materials.

Cumulatively, the Three Oaks Mine would result in an incremental increase in the amount of hazardous materials being transported along the identified transportation routes. Due to the scheduled closure of the Sandow Mine shortly after initiation of mining at Three Oaks, the cumulative impacts due to the increase in hazardous materials traffic would be short-term. No cumulative impacts associated with the storage and use of hazardous substances are anticipated based on the proper implementation of spill prevention and emergency response plans. In addition, the Three Oaks Mine is not anticipated to result in cumulative impacts on the generation of hazardous waste.

Public Health

The proposed Three Oaks Mine is not anticipated to adversely affect the health of local residents. Potential mine-related impacts associated with water quality, air quality, noise, and lighting effects were evaluated. Specifically, the impact assessment addressed the potential effects of trace metals in the lignite, dust generated by mining operations, effects of chemical constituents used during mine reclamation, and the effects of increased noise and night lighting from mine operation.

Environmental Justice

Minority populations in the vicinity of the Three Oaks Mine permit area do not surpass the population thresholds specified in federal guidelines that would trigger environmental justice concerns. Consequently, no disproportionate adverse effects on minorities have been identified. An extensive effort was made to disseminate information on the project and solicit public comments from all interested parties in a non-discriminatory manner.

ACRONYMS AND ABBREVIATIONS

AAQS	Ambient Air Quality Standards
APLIC	Avian Power Line Interaction Committee
AQCR	Air Quality Control Region
BACT	Best Available Control Technology
BEG	Bureau of Economic Geology
BLM	Bureau of Land Management
BMP	Best Management Practices
BNSF	Burlington Northern Sante Fe
BPA	Bonneville Power Administration
BTU	British thermal unit
BTU/lb	British thermal unit per pound
C	Celcius
CAA	Clean Air Act of 1990
CAAA	Clean Air Act Amendment
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
CPS	City Public Service
CR	County Road
CWA	Clean Water Act of 1972
dBA	decibels on the A-weighted scale
dbh	diameter breast height
EHA	Espey Huston and Associates, Inc.
EIS	Environmental Impact Statement
EMS	Emergency medical services
EPCRA	Emergency Planning and Community Right-to-Know Act
ERP	extended responsibility period
ESA	Endangered Species Act
F	Fahrenheit
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FM	Farm-to-Market
gpm	gallons per minute
GTE	General Telephone and Electronics Corporation
HAP	hazardous air pollutant
HCP	habitat conservation plan
HUD	U.S. Department of Housing and Urban Development
Hz	Hertz
ISD	independent school district
KOP	key observation point

kV	kilovolt
lbs/ac/yr	pounds per acre per year
LCRA	Lower Colorado River Authority
L_d	day average sound level
L_{dn}	day-night average noise levels
L_{eq}	equivalent continuous sound level
L_n	night average sound level
LOM	Life-of-mine
LOS	level of service
MACT	Maximum Achievable Control Technology
$\mu g/m^3$	micrograms per cubic meter
µm	micrometers
mg/l	milligrams per liter
MMBTU	million British thermal unit
MMCFD	million cubic feet per day
MOA	memorandum of agreement
mph	miles per hour
MSDS	Material Safety Data Sheet
MSHA	Mine Safety and Health Administration
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves and Repatriation Act of 1990
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NGS	National Geographic Society
NGVD	National Geodetic Vertical Datum
NH_3	ammonia
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_3	nitrate
NOAA	National Oceanographic and Atmospheric Administration
NO_x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NSPS	New Source Performance Standards
NTU	nephelometric turbidity unit
NWI	National Wetland Inventory
O_3	ozone
OHWM	ordinary high water mark
OPA 90	Oil Pollution Act of 1990
OSHA	Occupational Safety and Health Administration
OSM	Office of Surface Mining
Pb	lead

PHC	probable hydrologic consequences
PLS	pure-live-seed
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
ppm	parts per million
ppmv	part per million by volume
PSD	Prevention of Significant Deterioration
RECON	Regional Environmental Consultants
RCRA	Resource Conservation and Recovery Act
ROW	right-of-way
RRC	Railroad Commission of Texas
RUSLE	Revised Universal Soil Loss Equation
RWHA	R. W. Harden & Associates, Inc.
SAR	Sodium adsorption ratio
SARA	Superfund Amendment and Reauthorization Act
SAWS	San Antonio Water System
SCS	Soil Conservation Service
SH	state highway
SI	System International
SIP	State Implementation Plan
SO_2	sulfur dioxide
SPCC Plan	Spill Prevention, Control, and Countermeasures Plan
SR	State Route
TAC	Texas Administrative Code
TAS	Turpin and Sons, Inc.
TASS	Texas Agriculture Statistics Service
TAMU	Texas A&M University
TBCDS	Texas Biological and Conservation Data System
TDA	Texas Department of Agriculture
TDS	total dissolved solids
THC	Texas Historical Commission
TLV	Threshold Limit Value
TNRCC	Texas Natural Resource Conservation Commission
TOS	Texas Ornithological Society
TPDES	Texas Pollutant Discharge Elimination System
tph	tons per hour
TPWD	Texas Parks and Wildlife Department
TRB	Transportation Research Board
TSHA	Texas State Historical Association
TSP	total suspended particulate
TUFCO	Texas Utilities Fuel Company
TVA	Tennessee Valley Authority
TWA	Time-Weighted Average
TWDB	Texas Water Development Board

TWRI	Texas Water Resources Institute
TxDOTS	Texas Department of Transportation
TXU	Texas Utilities
umhos/cm	micromhos/centimeter
UPSP	Union Pacific Southern Pacific
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTSA	University of Texas at San Antonio
VERP	Voluntary Emission Reduction Permit (Texas)
VOC	Volatile Organic Compounds